# Wildfires

## **Chapter 13**

# **Introduction to Wildfire**

## **Wildfires are on of nature’s oldest phenomena**

### Dating back 350 million years

### About 20 million years ago, wildfire changed due to a change in fuel

#### New type of grass evolved which was able to sustain more frequent wildfires

### About 11,500 years ago, after the last glaciation, when the climate warmed, wildfire behavior intensified again.

### Part of the increase probably reflects early humans who used fire to clear land and assist in hunting.

## Before humans wildfire was ignited by lighting or volcanic eruption.

### These fires would until they ran out of fuel or were extinguished naturally.

### After the fire, plants would regrow from roots, spores and seeds. The cycle starts again

### **These natural fires allowed man to capture and harness fire for heat, light, and cooking.**

### **This allowed the human population to grow.**

# **Wildfires as a Process**

## **Wildfire is a:**

### Self-sustaining

### Rapid

### High-temperature

### Biochemical oxidation reaction

## **Which releases**

### Heat

### Light and other products

## **This reaction requires:**

### Fuel

### Oxygen

### Heat

# **Phases of a Wildfire**

## **Preignition – First Phase**

### Fuel is brought to both a temperature and water content that favors ignition – two processes

#### Preheating – fuel loses a great deal of water and other volatile chemical compounds

#### Pyrolysis – chemical degradation by the heat of the fire

#### These processes combined absorb energy

#### These two processes are like scorching a piece of paper

## **Combustion – Second Phase**

### Begins with ignition-where the process are completely different that Preignition

### Develop when there are sufficient sources of fuel

#### This usually happens every 50 to 100 years

##### With or without humans

#### Ignition is not a single—there is usually increase in pyrolysis.

### Two types of combustion

#### Flaming combustion

#### Smoldering combustion

## **Extinction – Third Phase –** when one of the parts of the triangle are not present

# **Wildfire Environment**

## **Fuel**

### Wildfires rely on fuel, without fuel, there is no fire.

#### Fuel consists of leaves twigs, decaying material, and peat

#### The size of the fuel can influence the ignition and movement of the fire

#### Fuel arrangement is also important

#### Drought is the last and most influential cause of wildfires

## **Topography**

### Topography can have a profound effect on the behavior of a wildfire

#### Flat topography and no wind – fire doesn’t move, internal radiant heating and convection – doesn’t burn surrounding trees

#### Flat topography and wind – flames are blown direction of the wind. Possible radiant heat will start surrounding trees on fire

#### Slope and wind – both the slope and wind influence flames. Fire travels up a hill with a wind behind it.

## **Weather**

### Weather has a dominant influence on the wildfire

#### Temperature, precipitation, moisture content (humidity), and winds

#### Dry thunderstorms with lighting, during the summer of a drought can be disastrous in starting wildfires

#### Wind – can help spread the embers of a wildfire over an area of very dry vegetation. This can start more fires.

# **Types of Fires**

## **Ground Fires** – fires that creep along slowly just under the ground surface, with little flaming and more smoldering combustion

## **Surface Fires** – fires that move along the ground, may vary greatly in their intensity, that is, the amount of energy released

## **Crown Fires** – fires which flaming combustion is carried through the canopies of trees

# **Effects of Wildfires and Linkages with other Natural Hazards**

## **Wildfires affect many aspects of the local environment:**

### They burn vegetation

### Release smoke into the atmosphere

### Char the Soil

### Create favorable conditions for landslides

### Increases erosion and runoff

### May harm wildlife

## **There are also effects on the overall geologic and atmospheric environments**

# **Effects on the Geologic Environment**

## Wildfires have different effects on the soils

### Depends on the type and moisture content of soil

### Duration and intensity of the wildfire

## Extremely hot fires may leave a scorched dry soil

### This soil will probably not absorb water after the fire

#### This would be called the hydrophobic layer in the soil – it is water repellant

### This causes the soil to erode and landslides to happen

# **Effects on the Atmospheric Environment**

## In a short term: Wildfires create their own clouds and release smoke, soot, and invisible gases that contribute to air pollution

### The soot and smoke increase the small particulates in the atmosphere

### This soot and smoke can be seen miles downwind in large, long-lasting fires.

### Wildfires also can contribute to the formation of smog with an increase in carbon monoxide, organic compounds and nitrogen oxides

# **Effects on the Biological Environment**

## Fires have direct and indirect effects the on the biological environment

### These include:

#### Vegetation – numerous, varied, and complex – some plants die, some don’t, some actually propagate in a fire

#### Animals – occasionally with very large fires, animals are harmed, but for the most part animals are able to avoid being harmed by wildfire

#### Humans – smoke and haze can make life difficult for humans. Humans are also have problems with lack of vegetation caused by the fire which can cause erosion

# **Natural Service Functions of Wildfires**

## Wildfire, although threatening to human life and property, can be beneficial to the ecosystems of the earth.

### Benefits to the soil

#### Increase to the nutrient content of the soil and leave an accumulation of carbon on the surface in the form of carbon

### Benefits to plants and animals

#### By reducing the number of individuals of species of plant in a given area the result may be beneficial to the plant community

#### By having a fire, a dominant vegetation may be helped by the occurrence of wildfires

#### Burning plant material recycles nutrients by quickly decomposing organic matter and allowing new plants to grow

# **Minimizing the Wildfire Hazard**

## Fire Management

### Difficult because wildfires are hard to prevent

### Not all fires need to be suppressed

## Reasons for Fire Management

### Science

### Education

### Data Collection

### Prescribed Burns

### Science: learn the fire regime of an ecosystem

#### The types of fuel that are found in plant communities

#### Typical fire behavior as described by fire size, intensity, and amount of biomass removed

#### The overall fire history of the of the area, including fire frequency and recurrence interval

### Education: Public education is an integral part of fire management. (Smokey Bear, “Only you can prevent forest fires”)

### Data Collection: Using Remote Sensing as a tool for finding areas that are dry and have fire potential

### Prescribed Burns: Used to protect urban areas where the surrounding area is dry and could catch fire

# **Perception of and Adjustment to the Wildfire Hazard**

## In general, people who live or work in the wildland/urban interface do not adequately realize the risk from wildfires

### What adjustments do we need to do to avoid the risks

#### Fire Danger Alerts and Warnings

#### Fire Education

#### Codes and Regulations

#### Fire Insurance

#### Evacuation